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New muon monitor for J-PARC neutrino experiment

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The T2K experiment is a neutrino oscillation experiment running at J-PARC. In order to increase the statistics of neutrino data and improve the sensitivity to CP violation, upgrade of the neutrino beam is currently ongoing. The repetition cycle will be shortened from 2.48s to 1.16s and the number of protons in each pulse will be increased. With these upgrades, the beam intensity will be increased from 510 kW to 1.3MW. In the T2K experiment, the beam direction and profile are monitored by detecting muons produced simultaneously with neutrinos. Si PIN photodiodes and ionization chambers have been used as muon monitors, but these monitors need to be updated after the beam upgrade due to radiation damage or non-linearity at high intensity. Therefore, we are studying Electron Multiplier Tube (EMT) as a new detector candidate. It was shown by the previous study that EMTs have superior radiation tolerance than Si detectors. However, it was also shown that the gain drops for initial radiation and then further decreases after certain amount of radiation, corresponds to more than 100 days of 1.3 MW beam exposure. In order to improve the radiation tolerance of EMT, further studies are ongoing to address initial instability and to extend the life of the EMT. For these purposes, beam tests were conducted at ELPH in Tohoku University. In this beam test, the variation of the gain was confirmed with further radiation and the cause of the variation was investigated by changing the conditions of radiation for each component. Another study indicates the cause of the initial instability is due to the temperature dependence. We report the results of these studies.

Attendance type

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